

SAFETY DATA SHEET

HMX

SECTION 1: Identification of the substance/mixture and of the company/undertaking

Date issued 10.01.2011
Revision date 03.10.2013

1.1. Product identifier

Product name HMX
Chemical name 1,3,5,7-Tetranitro-1,3,5,7-tetraazacyklooktan
REACH Reg No. 01-2119964438-25-0001
CAS no. 2691-41-0
EC no. 220-260-0
Formula C₄H₈O₈N₈

1.2. Relevant identified uses of the substance or mixture and uses advised against

Product group Explosives
Use of the substance/preparation Industrial use, professional use, explosive, ammunition, pyrotechnic articles, Laboratory activities
See SECTION 16 for a complete list of uses for which an exposure scenario is provided as an annex.
Uses advised against No information available.

1.3. Details of the supplier of the safety data sheet

Manufacturer

Company name Chemring Nobel AS
Postal address Engeneveien 7
Postcode N-3475
City SÆTRE
Country Norway
Tel +47 32 27 86 00
E-mail Richard.Gjersoe@chemringnobel.no
Website <http://www.chemringnobel.no/>
Contact person Richard Gjersøe

1.4. Emergency telephone number

Emergency telephone NHS Direct (UK):0845 4647 (24h/24h)

SECTION 2: Hazards identification

2.1. Classification of substance or mixture

Classification according to 67/548/EEC or 1999/45/EC T; R24
Xn; R22
E; R2
Classification according to Regulation (EC) No 1272/2008 [CLP/GHS] Expl. 1.1; H201;
Acute tox. 4; H302;
Acute tox. 3; H311;
Substance / mixture hazardous properties Explosive with mass explosion hazard. Harmful if swallowed. Toxic in contact with skin.

2.2. Label elements

Hazard Pictograms (CLP)



| | |
|--------------------------|--|
| Signal word | Danger |
| Hazard statements | H201 Explosive; mass explosion hazard. H302 Harmful if swallowed. H311 Toxic in contact with skin. |
| Precautionary statements | P210 Keep away from heat/sparks/open flames/hot surfaces. – No smoking. P250 Do not subject to grinding/shock/friction. P280 Wear protective gloves/protective clothing/eye protection/face protection. P370 + P380 In case of fire: Evacuate area. P372 Explosion risk in case of fire. P373 DO NOT fight fire when fire reaches explosives. |

2.3. Other hazards

| | |
|---------------|---|
| PBT / vPvB | Not PBT / vPvB. |
| Health effect | Convulsions and poor coordination have been reported in animal studies. |

SECTION 3: Composition/information on ingredients

3.2. Mixtures

| Substance | Identification | Classification | Contents |
|--|---|--|----------|
| 1,3,5,7-Tetranitro-1,3,5,7-tetraazacyklooctane (HMX) | CAS no.: 2691-41-0 EC no.: 220-260-0 Registration number: 01-2119964438-25-0001 | E; R2 Xn; R22 T; R24 Expl. 1.1; H201; Acute tox. 4; H302; Acute tox. 3; H311; | 100 % |

| | |
|--------------------|---|
| Column headings | CAS no. = Chemical Abstracts Service; EU (Einecs or Elincs number) = European inventory of Existing Commercial Chemical Substances; Ingredient name = Name as specified in the substance list (substances that are not included in the substance list must be translated, if possible). Contents given in; %, %wt/wt, %vol/wt, %vol/vol, mg/m3, ppb, ppm, weight%, vol% |
| HH/HF/HE | T+ = Very toxic, T = Toxic, C = Corrosive, Xn = Harmful, Xi = Irritating, E = Explosive, O = Oxidizing, F+ = Extremely flammable, F = Very flammable, N = Environmental hazard |
| Substance comments | See section 16 for explanation of H- and R-phrases listed above. |

SECTION 4: First aid measures

4.1. Description of first aid measures

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|--------------|---|
| General | Emergency telephone number: see section 1.4. In case of unconsciousness or severe accidents, call 112. |
| Inhalation | Fresh air and rest. Consult a physician for specific advice. |
| Skin contact | Remove dust from dry skin. Remove contaminated clothing. Wash the skin immediately with soap and water. Get medical attention immediately. |
| Eye contact | Immediately flush with plenty of water for up to 15 minutes. Remove any contact lenses and open eyes wide apart. Contact physician if discomfort continues. |
| Ingestion | Drink a few glasses of water or milk. Vomiting should be induced only in consultation with medical personnel. Seek medical attention. |

4.2. Most important symptoms and effects, both acute and delayed

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|--|---|
| Acute symptoms and effects | Toxic in contact with skin. Ingestion or inhalation of dust may cause acute or chronic poisoning. Symptoms include headache, seizures, insomnia and nausea. |
| Delayed symptoms and effects | Convulsive seizures may occur several hours after exposure. |
| 4.3. Indication of any immediate medical attention and special treatment needed | |
| Other Information | Treat symptomatically. |

SECTION 5: Firefighting measures

5.1. Extinguishing media

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| Suitable extinguishing media | Extinguish surrounding fires with suitable extinguisher. |
| Improper extinguishing media | Do not fight fires involving explosives, risk of explosion! Fire in explosives can not be extinguished with any fire equipment. |

5.2. Special hazards arising from the substance or mixture

| | |
|-------------------------------|---|
| Fire and explosion hazards | Explosive; mass explosion hazard. Explosive by shock, friction, fire or other sources of ignition. |
| Hazardous combustion products | Can include, but are not limited to: Carbon monoxide (CO). Carbon dioxide (CO ₂). Oxides of nitrogen (NO _x) |

5.3. Advice for firefighters

| | |
|-------------------------------|---|
| Personal protective equipment | Use compressed air equipment when the chemical is involved in fire. In case of evacuation, an approved protection mask should be used. See also section 8. |
| Other Information | Evacuate all personell to a predetermined safe location. Notify authorities in accordance with emergency response procedures. If there is no risk involved, move the containers to a safe place. If not possible, cool with water from a safe position. |

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

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|------------------------------|---|
| Personal protection measures | Avoid contact with skin and eyes. Avoid inhalation of dust. Use protective equipment as referred to in section 8. |
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6.2. Environmental precautions

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| Environmental precautionary measures | Do not allow to enter into sewer, water system or soil. |
|--------------------------------------|---|

6.3. Methods and material for containment and cleaning up

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| Cleaning method | Moisten with water before handling. Spillage should be removed with an aluminum or wooden shovel and placed in a suitable container for later burning. Dispose of in accordance with local regulations for waste handling (see section 13). |
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6.4. Reference to other sections

| | |
|--------------------|----------------------|
| Other instructions | See section 7 and 8. |
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SECTION 7: Handling and storage

7.1. Precautions for safe handling

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| Handling | Only to be handled by authorized personnel. The explosives must be under supervision and unavailable for persons not concerned. Protect against heating. Protect against physical damage and/or friction. Avoid handling which leads to dust formation. |
|----------|---|

Protective Safety Measures

| | |
|---------------------------------|---|
| Safety Measures To Prevent fire | Do not use near naked flames or glowing materials. Keep away from sources |
|---------------------------------|---|

| | |
|--|--|
| | of ignition - No smoking. Take precautionary measures against static discharges. Ground / bond container and receiving equipment. |
| Advice on general occupational hygiene | Do not eat, drink or smoke during work. Wash hands at the end of each work shift and before eating, smoking and using the toilet. Wash contaminated clothing before reuse. |

7.2. Conditions for safe storage, including any incompatibilities

| | |
|------------------------------|--|
| Storage | Store dry in a well-ventilated place. Storage room must be locked and secured from fire. Store separated from: igniters. To be stored at temperatures between 0 and 30 °C. |
| Special risks and properties | Explosive by shock and heating. |
| Other Information | Comply with national regulation on the handling of explosives. Keep wetted with ≥ 15 % water. |

Conditions for safe storage

| | |
|---------------------------------|-----------------------------------|
| Advice on storage compatability | Keep away from: Oxidizing agents. |
|---------------------------------|-----------------------------------|

7.3. Specific end use(s)

| | |
|-----------------|-----------------|
| Specific use(s) | See section 16. |
|-----------------|-----------------|

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Occupational Exposure limit values

| Substance | Identification | Value | TWA Year |
|----------------------|----------------|----------------------|----------|
| Respirable dust | | 8-hour TWA: 5 mg/m³ | 2010 |
| Total inhalable dust | | 8-hour TWA: 10 mg/m³ | 2010 |

8.2. Exposure controls

| | |
|------------------------------|---|
| Occupational exposure limits | Provide adequate ventilation. Personal protection equipment should be chosen according to the CEN standards and in discussion with the supplier of the personal protective equipment. |
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Respiratory protection

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| Respiratory protection | Normally not required. Use mask with filter P2 in case of dust formation. |
|------------------------|---|

Hand protection

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| Hand protection | Use suitable protective gloves if risk of skin contact. No special material is recommended, as the chemical will not penetrate plastic or rubber. |
|-----------------|---|

Eye / face protection

| | |
|----------------|---|
| Eye protection | Use tight fitting goggles if dust is generated. |
|----------------|---|

Skin protection

| | |
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| Skin protection (except hands) | Wear appropriate protective clothing to protect against skin contact. |
|--------------------------------|---|

Appropriate environmental exposure control

| | |
|---------------------------------|---|
| Environmental exposure controls | Do not allow to enter into sewer, water system or soil. |
|---------------------------------|---|

Other Information

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|-------------------|---|
| Other Information | Eye wash facilities should be available when handling this chemical. Contaminated and wet clothing should be changed. The listed protective equipment is a recommendation. A risk assessment of the actual risk may lead to other requirements. |
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SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

| | |
|----------------|------------------|
| Physical state | Solid. / Powder. |
|----------------|------------------|

| | |
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| Colour | White. |
| Odour | None. |
| Comments, Odour limit | Not relevant. |
| Comments, pH (as supplied) | Not relevant. |
| Melting point/melting range | Value: 286 °C |
| Comments, Boiling point / boiling range | Not applicable since the substance decomposes without boiling. |
| Comments, Flash point | Not relevant. (Solid) |
| Comments, Evaporation rate | Not relevant. |
| Flammability (solid, gas) | Waiver. Substance has explosive properties. |
| Comments, Explosion limit | Not known. |
| Vapour pressure | Value: 0,00321 mPa Test temperature: 25 °C |
| Comments, Vapour density | Not applicable. |
| Specific gravity | Value: 1,9 g/cm ³ |
| Solubility in water | Poorly soluble. 4,46 mg/l (T = 25 °C) |
| Partition coefficient: n-octanol/water | Value: 0,165 Method of testing: Log Pow |
| Comments, Spontaneous combustability | Not entered. |
| Decomposition temperature | Value: ~ 280 °C |
| Comments, Viscosity | Not relevant. (Solid at room temperature and normal pressure). |
| Explosive properties | Explosive. |
| Oxidising properties | Test not conducted. The substance is explosive. |

9.2. Other information

Other physical and chemical properties

Physical and chemical properties Not known.

SECTION 10: Stability and reactivity

10.1. Reactivity

Reactivity No reactivity hazards.

10.2. Chemical stability

Stability Stable under normal temperature conditions and recommended use.

10.3. Possibility of hazardous reactions

Possibility of hazardous reactions Explosive when mixed with oxidizing substances.

10.4. Conditions to avoid

Conditions to avoid May detonate with impact, friction or on heating.

10.5. Incompatible materials

Materials to avoid Oxidizing agents.

10.6. Hazardous decomposition products

Hazardous decomposition products Thermal decomposition or combustion may liberate carbon oxides and other toxic gases or vapours. Nitrous gases (NO_x).

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Toxicological Information:

LD50 oral Value: 1670 mg/kg
Animal test species: Mouse
Comments: (key study)

LD50 oral Value: 6250 mg/kg

| | |
|-------------|---|
| | Animal test species: Rat Comments: (supporting study) |
| LD50 dermal | Value: 634 mg/kg Animal test species: Rabbit Comments: (key study) |
| LD50 dermal | Value: > 4230 mg/kg Animal test species: Rat Comments: (supporting study) |

Other information regarding health hazards

| | |
|---------|---|
| General | Ingestion or inhalation of dust may cause acute or chronic poisoning. Symptoms include headache, seizures, insomnia and nausea. Convulsive seizures may occur several hours after exposure. |
|---------|---|

Potential acute effects

| | |
|--------------|---|
| Inhalation | Inhalation of dust can cause headaches, seizures, insomnia and nausea. |
| Skin contact | Toxic in contact with skin. Skin penetration possible. |
| Eye contact | Dust may irritate the eyes. May cause stinging and redness. |
| Ingestion | Harmful if swallowed. Poisoning symptoms such as headaches, fatigue, shortness of breath may occur. |
| Irritation | Based on available data, the classification criteria are not met. |

Delayed effects / repeated exposure

| | |
|------------------------|---|
| Sensitisation | Based on available data, the classification criteria are not met. |
| Repeated dose toxicity | Based on available data, the classification criteria are not met. |
| STOT-single exposure | Based on available data, the classification criteria are not met. |
| STOT-repeated exposure | Based on available data the classification criteria are not met. |

Carcinogenic, Mutagenic or Reprotoxic

| | |
|------------------------|---|
| Carcinogenicity | Based on available data, the classification criteria are not met. |
| Mutagenicity | Based on available data, the classification criteria are not met. |
| Teratogenic properties | Based on available data, the classification criteria are not met. |
| Reproductive toxicity | Based on available data, the classification criteria are not met. |

SECTION 12: Ecological information

12.1. Toxicity

| | |
|--------------------------------|---|
| Acute aquatic, fish | Value: > 15 mg/l Method of testing: LC50 Fish, species: Pimephales promelas Duration: 96 h Test reference: (key study) |
| Acute aquatic, fish, Comments | Value: > 32 mg/l Method of testing: LC50 Fish, species: Lepomis macrochirus, Salmo gairdneri, Ictalurus punctatus and Pimephales promelas Duration: 96 h Test reference: (supporting study) |
| Acute aquatic, algae | Value: > 6,5 mg/l Method of testing: EC50 Algae, species: Scenedesmus capricornutum Duration: 96 h Test reference: (key study) |
| Acute aquatic, algae, Comments | Value: > 32 mg/l Method of testing: EC50 Algae, species: Microcystis aeruginosa, Anabeana flos-aquae, Selenastrum capricornutum and Navicula pelliculosa Duration: 96 h |

| | |
|----------------------------------|--|
| Acute aquatic, Daphnia | Test reference: (supporting study) Value: > 15 mg/l Method of testing: LC50 Daphnia, species: Daphnia magna Duration: 48 h Test reference: (key study) |
| Acute aquatic, Daphnia, Comments | Value: > 32 mg/l Method of testing: LC50 Daphnia, species: Daphnia magna, Gammarus fasciatus, Asellus militaris and Chironomus tentans Duration: 48 h Test reference: (supporting study) |
| Ecotoxicity | The chemical is not classified as harmful to the environment. |

12.2. Persistence and degradability

Persistence and degradability The product is not readily biodegradable.

12.3. Bioaccumulative potential

Bioaccumulative potential Will not bio-accumulate. Log Pow = 0,165

12.4. Mobility in soil

Mobility The product has poor water-solubility.

12.5. Results of PBT and vPvB assessment

PBT assessment results The substance does not meet current criteria for PBT (Persistent, bioaccumulative and toxic).

vPvB evaluation results The substance does not meet current criteria for vPvB (very persistent and very bioaccumulative).

12.6. Other adverse effects

Other adverse effects / Remarks Do not allow to enter into sewer, water system or soil.

Additional ecological information Fish: NOEC (32d) > 3,3 mg/l

Daphnia: NOEC(28 d) > 3,9 mg/l

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Specify the appropriate methods of disposal Residues of explosives must immediately be removed for intermediate storage and disposed for safely destruction. Product and package is hazardous waste. Contact local authorities regarding waste treatment of explosives.

Product classified as hazardous waste Yes

SECTION 14: Transport information

14.1. UN number

| | |
|-----------|------|
| ADR | 0226 |
| RID | 0226 |
| IMDG | 0226 |
| ICAO/IATA | 0226 |

14.2. UN proper shipping name

| | |
|-----------|-------------|
| ADR | HMX, WETTED |
| RID | HMX, WETTED |
| IMDG | HMX, WETTED |
| ICAO/IATA | HMX, WETTED |

14.3. Transport hazard class(es)

| | |
|-----|------|
| ADR | 1.1D |
|-----|------|

| | |
|-----------|------|
| RID | 1.1D |
| IMDG | 1.1D |
| ICAO/IATA | 1.1D |

14.4. Packing group

| | |
|---------|---------------|
| Comment | Not relevant. |
|---------|---------------|

14.5. Environmental hazards

14.6. Special precautions for user

| | |
|----------------------------------|---|
| ADR additional information | Packing instructions: P112(a), PP45, MP20 |
| RID Other applicable information | Packing instructions: P112(a), PP45, MP20 |
| EmS | F-B, S-Y |
| ICAO/IATA Additional information | PROHIBITED |

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

| | |
|--------------------|---------------|
| Pollution category | Not relevant. |
|--------------------|---------------|

SECTION 15: Regulatory information

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|--------|-----------|
| EC no. | 220-260-0 |
|--------|-----------|

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

| | |
|-------------------------------|--|
| References (laws/regulations) | Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures (CLP-regulation) with later amendments. REGULATION (EC) No 1907/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) EH40/2005 Workplace exposure limits, with later amendments. The Hazardous Waste (England and Wales) Regulations 2005 with amendments. National regulation regarding handling of explosives. (Directive 93/15 EEC) Dangerous Goods regulations |
|-------------------------------|--|

15.2. Chemical safety assessment

| | |
|--------------------------------------|-----|
| Chemical safety assessment performed | Yes |
|--------------------------------------|-----|

SECTION 16: Other information

| | |
|--|---|
| Supplier's notes | The information contained in this SDS must be made available to all those who handle the product. |
| Classification according to Regulation (EC) No 1272/2008 [CLP/GHS] | Expl. 1.1; H201; Acute tox. 4; H302; Acute tox. 3; H311; |
| List of relevant R-phrases (under headings 2 and 3). | R2 Risk of explosion by shock, friction, fire or other sources of ignition. R22 Harmful if swallowed. R24 Toxic in contact with skin. |
| List of relevant H-phrases (Section 2 and 3). | H302 Harmful if swallowed. H311 Toxic in contact with skin. H201 Explosive; mass explosion hazard. |
| Recommended restrictions on use | The product can only be handed out to personnel that have valid permits issued by the police. |
| Abbreviations and acronyms used | PBT: Persistent, Bioaccumulative and Toxic vPvB: very Persistent and very Bioaccumulative LD50: Lethal dose, is the amount of a substance given to a group of test animals, which causes the death of 50%. LC50: Concentration in water having 50% chance of causing death to aquatic life |

| | |
|--|---|
| | EC50: The effective concentration of substance that causes 50% of the maximum response NOEC: No observed effect concentration |
| Additional information | Overview of identified uses of the substance: Manufacture of HMX: PROC 3, 9. ERC 1. Formulation of HMX: PROC 3, 9. ERC 2, 3. Use as a substance/mixture for ammunition: PROC 5, 9, 14. ERC 5. Laboratory activities – Research and Development: SU 24. PROC 9, 14, 15. ERC 5. Use of ammunition: PROC 1. Use of HMX-products: SU 2a, 2b, 15. PROC 2, 9, 14, 24. |
| Important data sources used to construct the safety data sheet | Dossier from Chemring Nobel AS (CLP). Information in CSR Report Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine dated 22.03.2013. |
| Information which has been added, deleted or revised | Version: 2. Amendment, section: 1-16. |
| Checking quality of information | This SDS is quality controlled by National Institute of Technology in Norway, certified according to the Quality Management System requirements specified in ISO 9001:2008. |
| Responsible for safety data sheet | Chemring Nobel AS |
| Prepared by | National Institute of Technology as, Norway v/ Knut Finsveen |